Swarm Prevention Alternative

Checkerboarding Results and Conclusions

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For those of you who came in late, checkerboarding (CB) is what we called breaking up the overhead honey for wintering bees. This is accomplished by substituting empty brood comb on an alternate frame basis in the overhead honey above the cluster. The intent of checkerboarding was to provide nectar storage space continuously from the band of open feed cells at the top of the brood nest to the overhead supers. If they would store nectar above the brood nest, it would take storage space pressure off the brood nest (ABJ June 96). In early May we reported that build-up swarms were replaced by queen supersedure (ABJ July 96). The following is the final chapter in this experimental concept, and is written after the July harvest.

No Swarms

The primary objective of the checkerboarding test was to discourage the swarm "impulse". As best as we could discern, we had zero swarms in 1996. The reason we have to hedge on a positive statement is that we quit looking for swarm cells when it became apparent that the strongest colonies were superseding, and we were damaging supersedure cells by separating brood chambers. We can say positively that we saw no sudden population decreases as would be the case subsequent to a colony having swarmed. An indication of population history for each colony was recorded by the date noted on supers as they were added. When you open a hive, even without that history, it's normally fairly obvious when a colony has swarmed. Your first reaction is "what happened to the bees?" But you know, without getting an answer to the question.

Locally, it was a "swarmy" season. The bees were slow building population because of severe March freezes and the resultant shortage of early season forage. Then in late April/early May, it all came in at once and didn't last long. The late surge of nectar availability pushed many colonies into swarm commit a month late. The late "swarmy" season makes the effectiveness of checkerboarding even more convincing as a deterrent to swarming.

We are pleased that the results of the checkerboarding test indicate that as a management technique, it has the potential for virtually eliminating build-up swarms. But we are really excited about the fringe benefits. Some we might mention before we turn our attention to honey production follow:

1. The acceleration of build-up fostered by unrestricted brood nest expansion might be used to good advantage by the package bee sellers. They have had trouble keeping up with demand lately.

2. Those commercial beekeepers who systematically requeen in the spring can save the operational expense of that management activity. If supersedure is automatic, the colony gets the best queen available with minimum colony impact on build-up.

3. The early population increase might make colony division more practical in our area.

Honey Production Was Both Disappointing and Encouraging

In years past, one or two of 130 colonies would be outstanding producers in any given year. They would fill two or three supers of drawn comb in April when other colonies were still operating below their capped overhead honey. Surplus bees early in the season would alert us to the need for more space above. When supers were added, they promptly started storing nectar there. We called these random producers of twice the normal honey for the area the *five-super phenomenom*. With the same maintenance, they would not repeat the performance in the following or subsequent seasons.

The indications of the five-super phenomenon are the same as the effects of checkerboarded overhead honey. That makes us think we now know what induces the phenomenon. Either there was storage space in the overhead honey, or the phenomenon hive superseded early, or both.

This year was an extremely short season. We shouldn't have to make excuses for harvesting a lower average than a normal year, but the potential for much higher yields is so great that we feel obligated to wade through it.

Transition to Expansion Mode

The literature does not identify the differences in honey bee seasonal modes of operations. There are distinct activities which are only accomplished in one or more operational modes. The most notable evidence of operation in what we call the expansion mode is fabrication of new comb. During the build-up mode no new wax is generated, and during the expansion mode they can draw enough wax (new comb) to store all available incoming nectar not used for backfilling the upper reaches of the brood nest.

Between these two modes of operation, there is a transition period when there is little storage of surplus nectar. Some of the reasons for the storage slowdown are: Peak consumption by drones, loss of graduating nurse bees to house bee duties, ingestion of nectar by the wax makers, and recycling old capped honey. The transition period is about a full brood cycle and during this time some colonies gain, some lose, and some stay roughly the same. When house bees start graduating to forager duties in large numbers, the transition is complete and the colony moves into the expansion mode.

In this short season, the peak nectar availability caught the bees in the transition mode of operation. The last week of April and the first two weeks of May there was an abundance of sources. Every outyard had several of their favorite sources close at hand. Very little of this largess found its way into the supers. The folks who use hive scales to determine nectar availability would have recorded some grossly erroneous data during this season locally.

When the bees had transitioned to the expansion mode in mid-May, it was over. By the third week of May there was virtually no forager traffic to and from the hives. A later flow in June from white clover for a couple of weeks kept the season from being a disaster.

Beekeeping Errors

Peak nectar availability during the transition notwithstanding, the season production shortfall can be directly attributed to bungling by the beekeeper. In the strongest outyard, we had fractured supersedure queen cells on five of twelve hives. Three of those had to raise emergency queens, and as a result, missed rearing brood for a full brood cycle. Those three put up no surplus honey. Two others in that yard came out weak in late winter—one with worm-damaged comb in the cluster area and the other with a drone-laying queen. Both could have easily been salvaged by adding brood from stronger colonies. I was determined not to compromise the checkerboarding tests by taking brood from the strongest hives. The worm-damaged unit crashed and the drone layer was successfully superseded, but it was too slow building strength to contribute much (less than 1/2 super). Averaging five zeros into the output of twelve hives wrecked the average value.

The strong yard produced 31 supers of honey divided by 12 hives for an average yield of almost 2.6 supers per hive. This average is very close to the normal seasonal average using standard management techniques in this area. But all the honey was produced by seven hives. If we remove the outright bungling and failure to take corrective action by the beekeeper, the average looks much better. Thirty-one supers from seven hives is slightly more than 4.4 supers per hive in a short season. This might equate favorably with a normal season five-super phenomenon, or it might be better. The average production of honey in this area with prevailing management techniques is about 2 1/2 supers. This 2 1/2 supers is stored after the transition to the expansion mode. With checkerboarding they store two or three supers while still in the build-up mode. This has the effect of roughly doubling production in this area for a normal season.

We need to balance this talk of increased production with the reality of why we failed to achieve our normal seasonal average. To this point in the discussion of checkerboarding, when have not mentioned the two weak outyards. The bungling beekeeper let two outyards get hit hard by Varroa in 1995. Emergency treatment in late summer salvaged all but one hive, but they were not strong enough in the fall to store winter supplies. They were given checkerboarded honey and a few words of encouragement in the early winter. They made it through the winter, but were slow building in the spring. We surmise that they had not optimized the brood nest in the fall. At one point late in the build-up, the outyard log reports that they were about a month behind the strong yard in development. In mid April there were patches of dried cells in the overhead nectar of 3 to 4 inches, indicating a major push forward in brood nest expansion. In spite of their best efforts and apparent recovery from the Varroa problem, it was too late. The short season restricted their surplus to about one super per colony average.

When the Varroa recovery units were included in the overall average, if fell below the normal-season, standard-management level. That was the disappointing part. The increased average production in the "strong" yard was the encouraging part.

Consumer Bees

A 16 by 20 inch column of wall to wall bees seven feet tall is a thing of beauty to the beekeeper. But when this beautiful thing is present subsequent to nectar availability, it's cause for panic. Zillions of bees with nothing to gather can consume a sizable chunk of the potential profits. "Consumer" bees had not been a problem in this area in prior years with standard management practices because the bees would normally start to reduce brood rearing during the build-up phase by backfilling the upper part of the brood nest. In fact, with a long season, hives in this area often do not take full advantage of nectar available toward the end of the flow. Storage in the supers stops while nectar is still available.

Faced with the choice of drawing off the extra bees for the fish bait market or moving the bees to a nectar source, the decision was made to move them about 50 miles to the mountains for the sourwood flow. Two weeks went by while we secured mountain locations and rigged trailers for transport. A day or two from being ready to move, white clover granted a reprieve. The bees were working again!

The bees were not moved. To trade one of our better honey sources for unproven locations in the mountains seemed like an unwise choice. By the time white clover trailed off, the bees had limited brood production to a level where it seemed like it was a good time to treat for mites before cotton/soybeans came in. Honey was harvested and Varroa treatment applied.

We would expect the problem of "consumer" bees to resolve itself in a normal build-up season and a more gradual trail-off of nectar availability. If this does not turn out to be true, consumer bees may be a side effect of checkerboarding that will need to bee addressed in exchange for increased production. In this area, we have not had a limit brood volume, as is done in other parts of the country, but I'm confident we can learn how and when.

Retrospect

If you concede that nectar encroachment on brood nest volume could be the triggering mechanism to initiate swarm preparations, several things fall into place. The management actions currently recommended for swarm prevention have the effect of providing nectar storage space.

Early supering is highly recommended. If there is not a band of capped honey between the brood nest and the added super, the super of drawn comb provides storage space. Note that the literature states that foundation does not seem to do the job.

Hive body reversal is a standard swarm prevention technique. Several configurations of the brood nest, when reversed, result in overhead nectar storage space if any empty super is provided. The major swarm deterrent provided by reversal is the sandwiching of capped honey in between two areas of brood. This honey must be moved to unite the two brood volumes. They are no longer constrained by overhead capped honey and open cell nectar does not impede brood nest expansion.

Fall Swarms

We have seen the experts grapple with the question about why fall swarms are generated. The answer is quite simple. A strong or long fall flow. The bees want to build population on the upswing of nectar availability to take advantage of that availability. The bees resist storing above the wide band of capped honey overhead that is normally present at that time of year. Incoming nectar is stored in the top edge of the brood nest. Too much incoming nectar puts pressure on the brood volume. When that pressure meets their criteria,

swarm preparations are initiated.

Swarmy Years

Some years they all want to swarm and others they appear to be less inclined to swarm. The build up in either case appears to be roughly the same. Then answer again is quite simple. From year to year, there is great variability in nectar sources.

In the last four years, we have had two dark honey, one medium amber and one light honey season. One of the dark honey years was red. Nearly every super in the honey house ranged from pink to dark red. These obviously different honeys are an indication of the variability in nectar sources from year to year. If we conclude that the same variations prevail during the build up, there would be years when all colonies in the area would have excessive nectar. 1996 was such a year in this area. The late surge in nectar availability produced a "swarmy" year. The swarm season was delayed by about a month, but nectar availability did its job when it arrived.

Queen Cup Whitening

My *XYZ* book says that whitening of queen cups is an indication of congestion. Sorry, *XYZ*, but it has nothing to do with congestion. It *is* an indication of surplus nectar availability. In the early build-up the bees generate no new wax. It is just one the house bee's duties forfeited in favor of field force. They choose not to have inactive bees generating wax and putting a drain on honey stores. When excess nectar is available, they allow themselves the luxury of generating some new wax. They also add new wax to storage cells above the brood nest to increase storage capacity. In a normal season here, whitening occurs with redbud bloom and is an indication of the presence of conditions for swarm preparations—excess nectar for the storage space available.

Reversing Versus Checkerboarding (CB)

Reversing hive bodies helps with swarm prevention. The brood nest disturbance has the effect of limiting numbers of foragers during the build-up. A major reorganization of stores is required to get back on track with brood nest expansion. The bees do nothing internal to the hive in hurry. There is great inertia in thousands of participants embarking on a course of action as a unit. Collectively, they know what's best, but it takes time for the consensus to prevail.

After a major brood nest disturbance such as reversal, there is a confusion period when nothing happens. The bees have to learn how to care for the young with misplaced stores, or make other adjustments, just to reduce their losses. Slowly, the recovery plan emerges, but two weeks have elapsed. During this period, normal brood nest expansion activities have taken a back seat and the net result is fewer bees. Most of the workers above brood tending age are foragers during the build up and limiting the population reduces nectar storage pressure on brood nest volume.

In contrast, checkerboarding encourages brood nest expansion and bee population, while offsetting the inclination to swarm. It is a poor contest when choosing between the two options.

If you feel you *must* reverse, minimize the impact on the bees by assuring empty cells above the upper box with solid brood, flat to what was the separation plane. This will permit them to re-establish their open-cell feed band on incoming nectar without waiting for capped brood to emerge. The feed band will be in place for the next larvae cycle, and the top edge of cells will be used to recycle brood instead of building a new feed band.

Conclusions

If there is any aspect of beekeeping on which there is general agreement, it is that congestion is a primary factor in commitment to swarm. This writer believes that congestion, itself, is incidental. Honey bees likes congestion and they are at their best when crowded. Congestion, itself, is merely symptomatic of sufficient foragers to gather enough nectar to put storage space pressure on brood nest volume.

We will end this series on checkerboarding (CB) with what we believe is the reason CB works. In the evolutionary development of the honey bee, the reproduction strategy hinged on the following:

1. Storing of surplus honey over and to the sides of the brood nest.
2. Building downward from the top and maintaining the brood nest below the stored honey.
3. Miserly use of the overhead capped honey, while the spring build up takes advantage of early nectar sources to support brood rearing. The build up rate is scaled to nectar availability.
4. Most workers above brood-tending age are foragers during buildup. This maxamizes the potential for incoming nectar exceeding feed requirements.
5. A point in nectar availability is reached where it must be stored in the brood nest. This triggers swarm preparations.

CB distorts this strategy by providing storage space for the surge in nectar by providing openings of storage cells in overhead capped honey. The colony is no longer restricted by the capped honey overhead.

Sign Off

If this series has done nothing else, it has provided the post-graduate students with some project material. Devise valid research tests to confirm or refute the conjectures offered in this series.

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